



# **California DG Policy, Research, Commercialization and Beyond: The Search for Clear Direction**



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California Energy Commission  
September 23, 2003**



## Topics for Today's Discussion

- DG Policy Plans
- DG Regulations and Decisions
- Commercialization Activities
- Research Activities
- Appendix



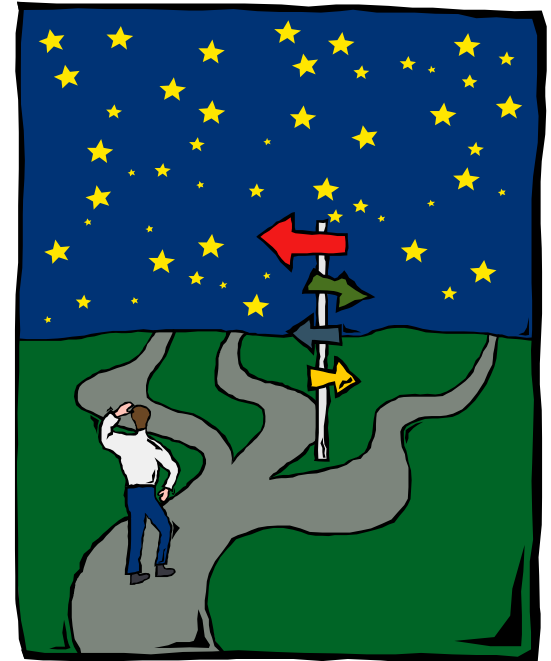
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# California Actually Has a DG Strategic Plan



- Energy Commission adopted DG Strategic Plan in June 2002.
- Plan's Vision: DG will be an integral part of California's energy system...provided it makes sense to do so.
- However, prospects for effective DG deployment depend upon removing regulatory, institutional, and business-related barriers.



Agency Collaboration is Essential to the Future Success of the Plan!!!!

# DG is Part of the “Energy Action Plan”



**CONSUMER POWER AND  
CONSERVATION  
FINANCING AUTHORITY**



**CALIFORNIA  
ENERGY COMMISSION**



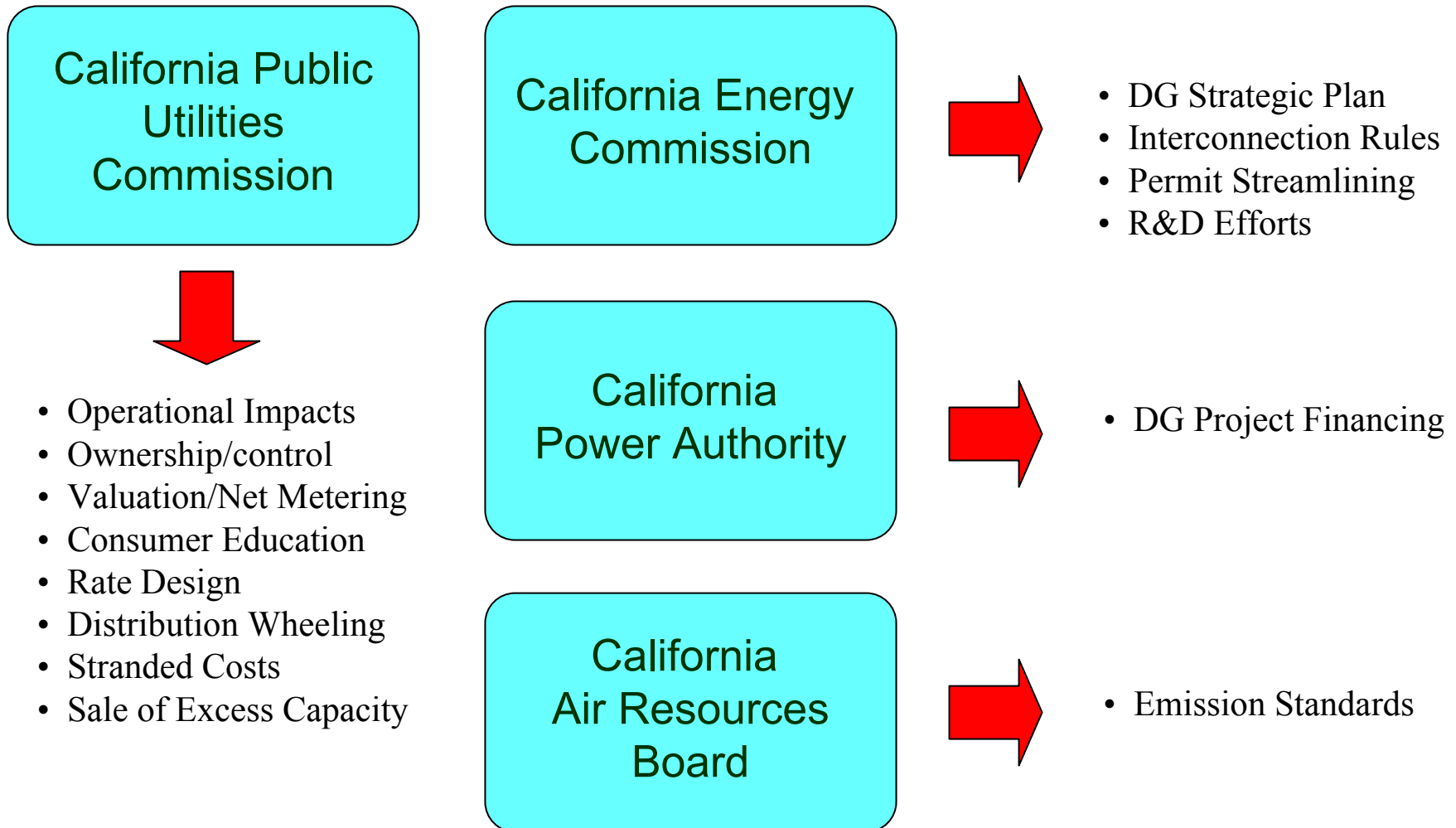
**PUBLIC UTILITIES  
COMMISSION**

## **Action Item 6: Promote Customer and Utility-owned Distributed Generation.**

The agencies will work together to further develop distributed generation policies, target research and development, track the market adoption of distributed generation technologies, identify cumulative energy system impacts and examine issues associated with new technologies and their use.



# Other Goal of Plan: Coordinate DG Activities Across State Agencies



# So Where Do We Go Now?



DG Policy direction is fine but the state needs a focused energy policy.

# The Answer: The CEC's Energy Report



A Committee Draft report which applies the basic “loading” order strategy advocated in the Energy Action Plan.”

- 1) Harvest Energy Efficiency
- 2) Diversify Fuel Types
- 3) Encourage Customer Alternatives
- 4) Improve Infrastructure





# Energy Report's Principal Recommendations



- Enhance energy efficiency programs to harvest additional 1200 MW of electricity and 100 MMBtus in energy savings.
- Enact legislation that accelerates RPS to 20 percent by 2010.
- Explore a retail market structure that promotes customer choice.
- Consolidate transmission permitting process at the Energy Commission
- Establish one-stop permitting process for petroleum infrastructure.



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# But There Are Still Lots of Barriers to Effective DG Deployment



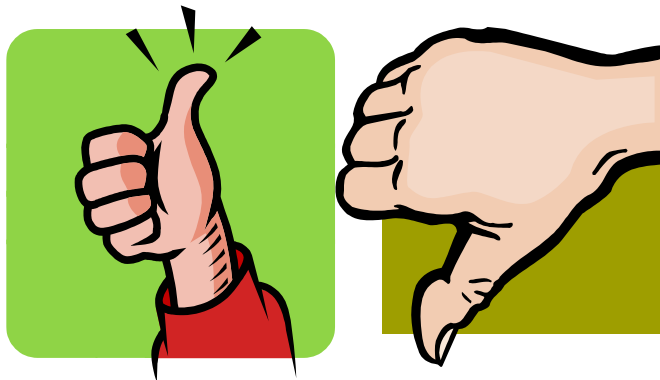
- Lack of standardized interconnection rules statewide.
- Standby charges.
- Stranded assets and exit fees.
- Air quality rules and misuse of emissions standards.
- Siting regulations.
- Financial barriers.



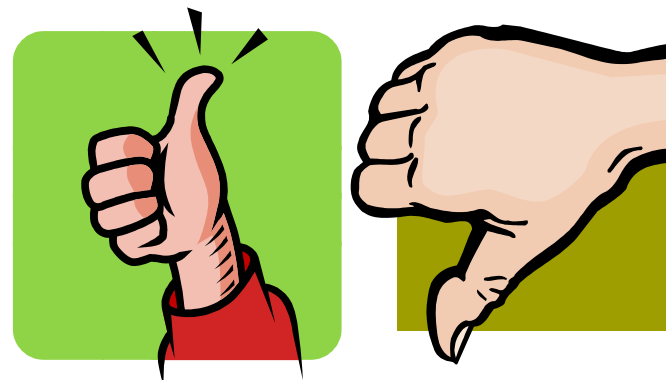
# DG Policy Decisions Have Had Mixed Results



Surcharges



Incentives



Interconnection



Utility Procurement



Net Metering



### AB1685 – Self Gen Program

Extends self-generation program and tightens emissions requirements.

Modifies definition of Ultra Clean and Low Emissions.

On governor's desk for signature.

### AB428 – Core/Noncore

Encourages retention of existing cogeneration and developing new cogeneration resources. Noncore tariffs to be established.

Failed Senate Energy Committee but granted reconsideration.





# Departing Load Exit Fees And Exemptions

## MAJOR SURCHARGE CATEGORIES



SCE Historical  
Procurement Charges  
6/00 - 1/17/01 Costs

DWR Bond Charges  
1/17/01 - 12/31/02  
Costs

DWR LT Contracts  
Charges  
2003 - ???? Costs

## ACTUAL FEE



2.7 cents/kWh until  
SCE PROACT paid

0.7 cents/kWh

2.7 cents/kWh???  
Equal to Direct  
Access Surcharge

## CUSTOMER EXEMPTIONS

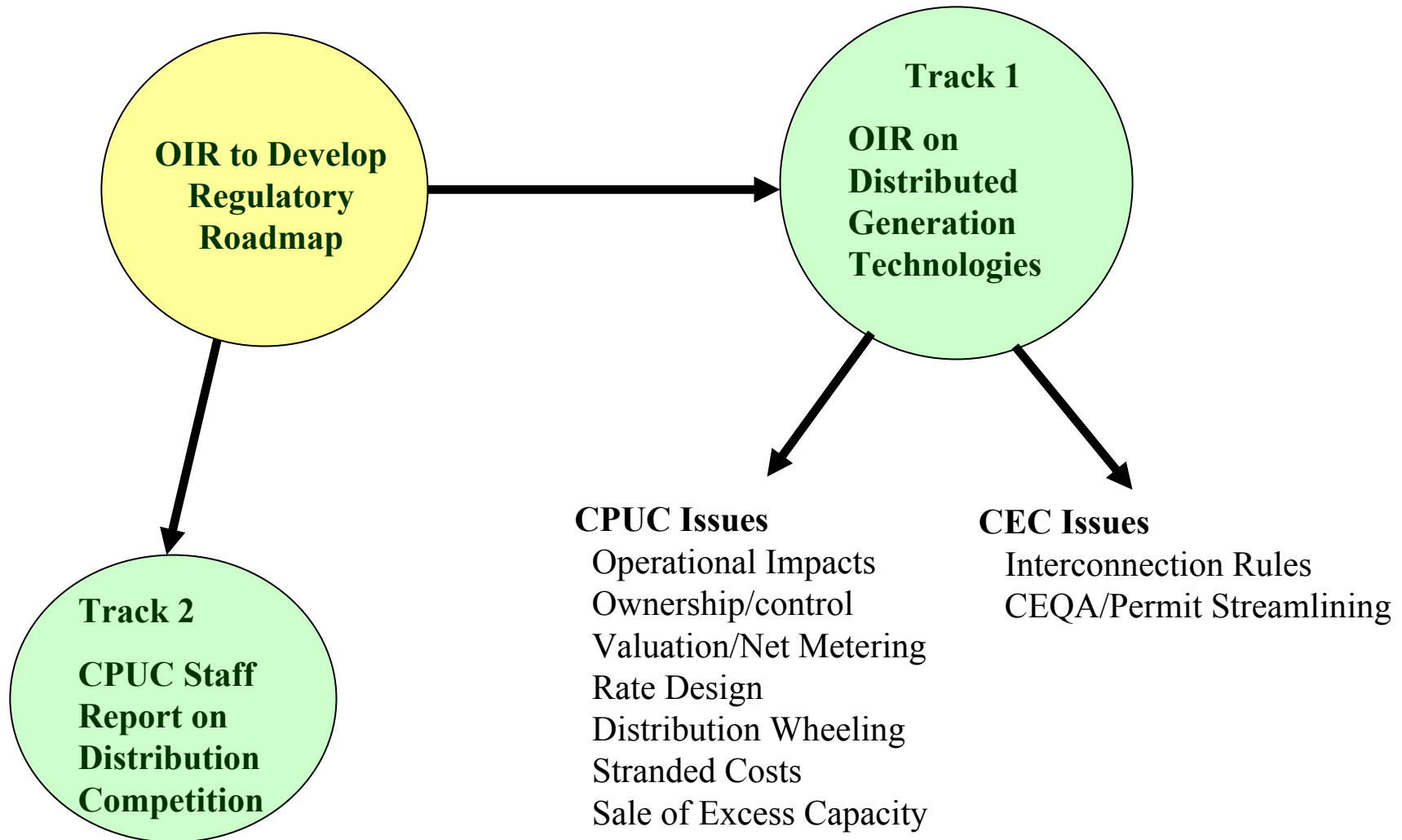
### Complete Exemption

- Net Metering customers below 1 MW.
- Biogas customers eligible under AB2228.
- Departing load Under 1 MW that is eligible for financial incentives from the CEC or CPUC.
- Departing load receiving service on or before 2/1/01.

### Exemption from DWR LT Contracts

- Departing load Above 1 MW but defined as “ultra-clean and low emissions” (No HPC payment either)
- 3000 MW of customer generation as determined by the CEC.
- Limit of 1500 MW to generation not classified as “ultra-clean and low emissions”

# Scope of Work Surrounding R.99-10-025



## Summary of Decision

- ★ • No restrictions on ownership of DG units.
- ★ • DG owner can be compensated for deferring distribution system upgrades, but only in limited circumstances.
  - No rate design changes needed at this time to accommodate DG.
  - No need to adopt a distribution-only tariff.
- ★ • Education effort will be “multi-pronged” and rely heavily on the Energy Commission.





# Operational Impacts

- CPUC finds that DG has potential system planning benefits but should be treated just as just another system planning option.
- When distribution-system upgrades are needed, utilities shall determine if a grid-side DG unit is a reasonable solution.
  - Utilities can procure DG at that point.
  - Compensation provided to DG provider only if the cost is less than the alternative distribution upgrade cost.



## Ownership/Control of DG

- Utility not required to own DG on the grid-side of the meter provided that it has sufficient operational control (physical assurance).
  - Third-party ownership allowed with physical assurances and participation in the utility planning process.
- No control or ownership needed on the customer side of the meter.
  - Utilities and affiliates are free to enter the customer-side DG market.



- CPUC envisions Energy Commission as the central repository for DG information, consistent with our commitment in October 2000.
- CPUC and Energy Commission will prepare information for a bill insert discussing DG options, available incentives and rebates, and other sources of DG information.
  - Inserts will be customer bills every six months.
- CPUC and Energy Commission will develop a DG payback tool, emissions information on DG technologies, and permitting requirement information.
  - Consistent with educational outreach efforts identified in energy Commission DG Strategic Plan adopted June 2002.



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# DG Has Become an Important Piece of the California Energy Picture...



Distributed generation accounts for more than 2000 megawatts in California.

**Reliability**  
**Power Quality**



# DG Interconnection Applications Under Rule 21



- Approximately 480 megawatts in DG load proposed since Rule 21 adopted in December 2000.
- 330 new megawatts approved and/or operational.

Application				
	Pending	MW	Approved	MW
PG&E	99	65.3	48	83.3
SCE	65	68.4	86	180.1
SDG&E	15	19.9	45	67.7
Total	179	153.6	179	331.1

## Renewables Buydown Program (March 1998)

- Incentive apply to PVs, small wind turbines, renewable fuel cells, and solar thermal electric.
- \$255 million allocated to program through 2006.
  - \$80 million remaining for systems < 30 kW

## CPUC DG Initiative Program (July 2001)

- Incentive apply to PVs, wind turbines, and fuel cells, microturbines, internal combustion engines, and small gas turbines.
- Administered by PG&E, SCE, SDG&E, and SoCalGas.
- \$125 million annual allocation through 2004.



# Renewables Program Results to Date



- Energy Commission has funded more than \$165 million in renewable DG.
- 6,000 systems (23 MW) installed to date.
  - 1,424 systems (6 MW) installed in 2003.
- More than 1,400 systems (8 MW) currently in review.







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- Established in California by AB 1890 and SB 90 in 1996-97 and implemented in 1998
- \$62.5 million collected annually from investor-owned electricity utility ratepayers for “public interest” energy research, development and demonstration (RD&D) projects



**PIER has 5 primary public benefit energy objectives. Research projects are considered for funding that, if implemented, produce technology, knowledge or procedures that will:**

- Improve energy cost/value
- Improve the environment, public health and safety
- Improve electricity reliability, quality and sufficiency
- Strengthen the California economy
- Provide greater choices for California consumers

## DER major PIER focus

- 84 projects totaling \$80M out of over \$255M in total PIER are DER related (projects under the small grant program are excluded)
- All six PIER program areas have projects that are DER related
- Research projects address all DER issues areas identified during Energy Commission DG Strategic Plan development

(As of Nov. 2002)



# Technology and Policy Issues

## Numerous issues were identified as part of Strategic Plan development

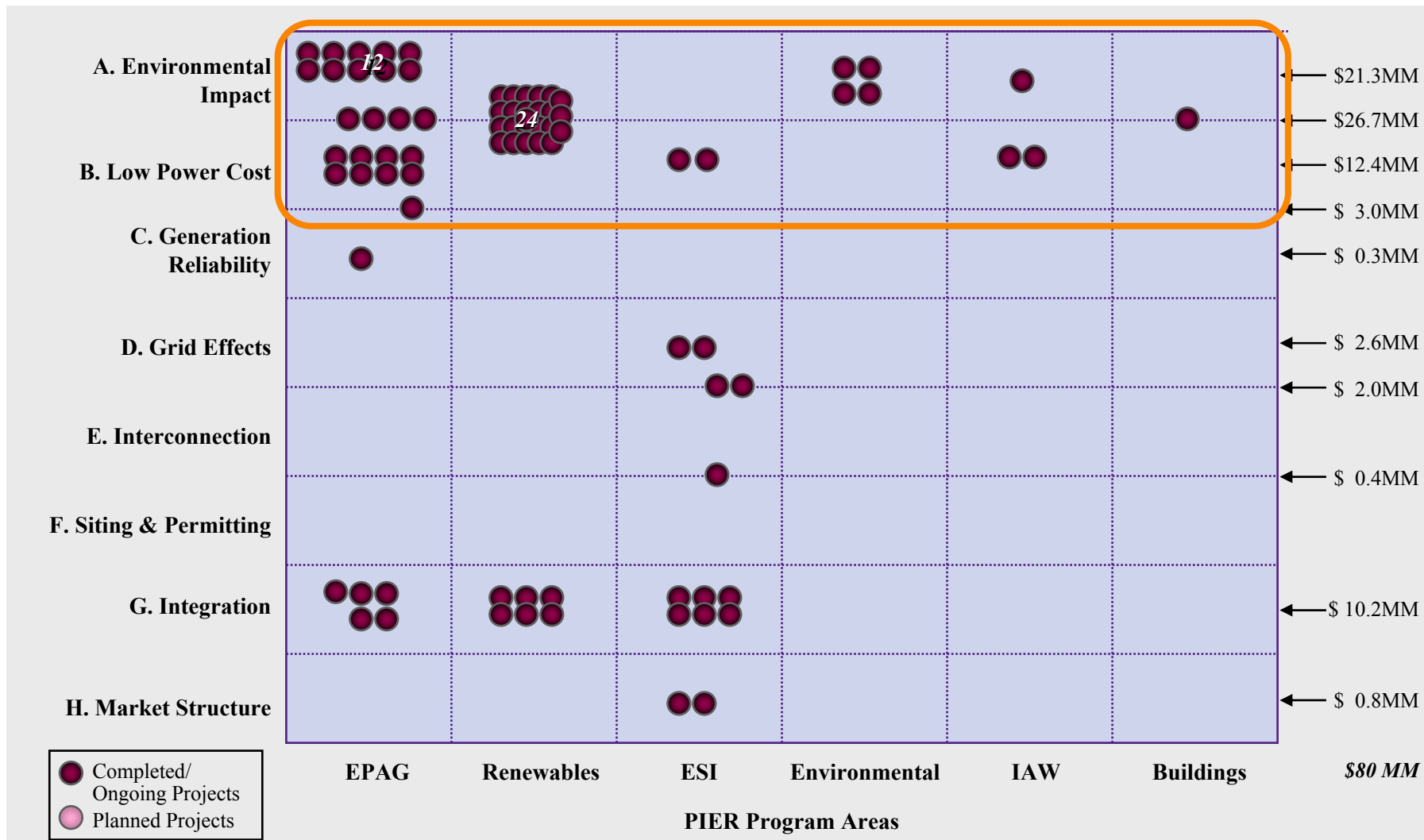
DER Issues	
<b>A. Environmental Impact</b>	<ul style="list-style-type: none"> <li>• When will DER technologies have a positive impact on the environment?</li> <li>• Should clean DER technologies be subsidized or otherwise encouraged?</li> <li>• Should DER be used to improve air quality?</li> <li>• Should DER improve worker health and safety?</li> </ul>
<b>B. Low Cost Power</b>	<ul style="list-style-type: none"> <li>• Can DER be competitive with central power generation?</li> <li>• Should customers have the choice of DER to reduce power cost?</li> <li>• Is DER the most economically efficient approach to generating and delivering power to customers?</li> </ul>
<b>C. Generation Reliability</b>	<ul style="list-style-type: none"> <li>• Will DER improve customer power reliability?</li> <li>• Can customers use DER for high reliability and power quality needs?</li> </ul>
<b>D. Grid Effects</b>	<ul style="list-style-type: none"> <li>• Will DER improve grid reliability?</li> <li>• Will DER have a positive or negative effect on the power system?</li> <li>• Can grid effects be monetized and allocated to stakeholders?</li> <li>• How can the locational value of DER be exploited?</li> <li>• How can you measure and reward consumers for the grid benefits they generate through use of DER?</li> </ul>
<b>E. Interconnection</b>	<ul style="list-style-type: none"> <li>• Should technical requirements, processes and contracts be modified for DER?</li> <li>• Can DER be safely and cost effectively interconnected with the power system?</li> <li>• Is plug and play possible for DER interconnection?</li> </ul>
<b>F. Siting &amp; Permitting</b>	<ul style="list-style-type: none"> <li>• Should siting and permitting requirements be modified for DER?</li> </ul>
<b>G. Integration</b>	<ul style="list-style-type: none"> <li>• How can DER be integrated with California's current system operations?</li> <li>• How can the system be operated to optimize DER?</li> </ul>
<b>H. Market Structure</b>	<ul style="list-style-type: none"> <li>• How can DER be integrated with California's current market structure?</li> <li>• Can the market structure be changed to create a win-win for all stakeholders?</li> <li>• How can utilities be incentivized to participate and/or encourage DER?</li> <li>• Can a market structure be created that will allow DER to compete?</li> <li>• Should California use net metering?</li> </ul>

Note: Issue candidates are not listed in any particular order

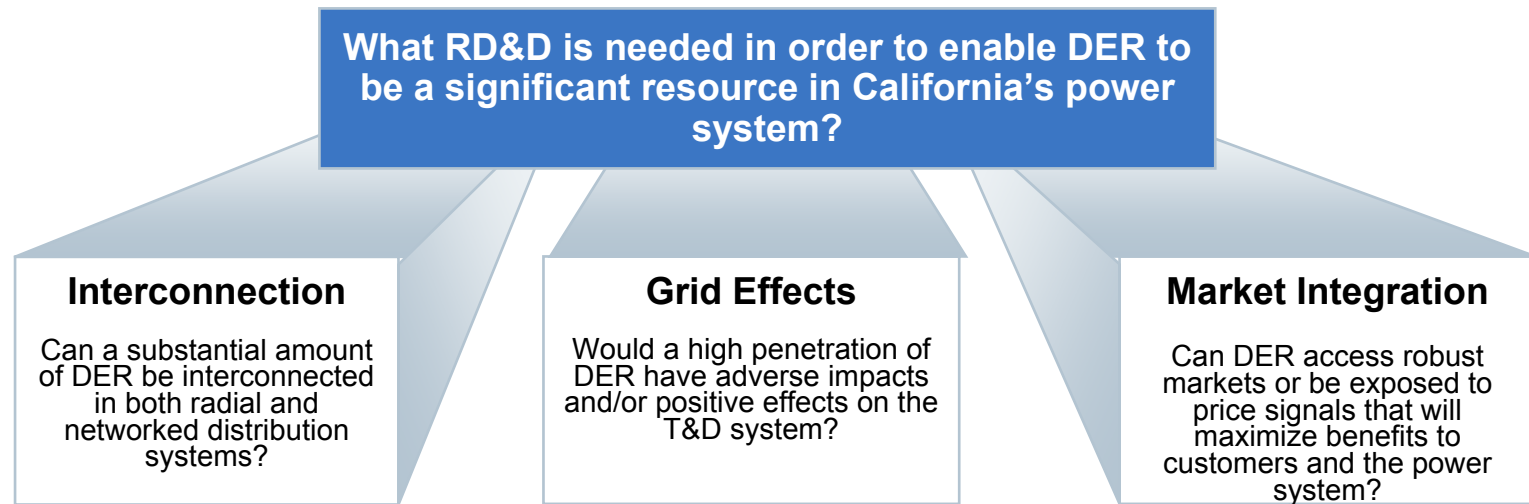


# PIER DER Portfolio

80% of PIER DER portfolio focused on reducing environmental impact and developing lower cost power



# DER Integration Focuses on Systems Research That Links Technology and Policy



## Benefits of Doing Research

- CPUC adopts interconnection rules as revised
- New research focus on grid and environmental benefits will inform CEC and CPUC policy
- Power system paradigm shifted to decentralized structure creating benefits such as:
  - **More Reliability and Quality** → Greater flexibility and resiliency to disturbances through optimal control and operation of DER and power system
  - **More Efficient and Cheaper** → Reduction of T&D losses, congestion and better use of fuel through CHP
  - **Quicker System Expansion** → Modularity and scalability of DER enables quicker, more flexible increases in system capacity and to address regional specific problems
  - **Improved Environmental Impact** → Economic environmental dispatch strategies

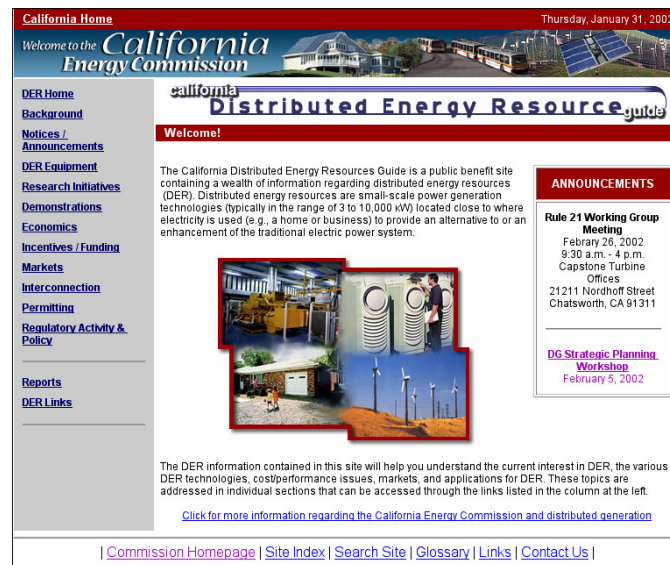


# For Up to Date Info, Check Out These Web Sites



## consumer energy center

[www.consumerenergycenter.org](http://www.consumerenergycenter.org)



[www.energy.ca.gov/distgen](http://www.energy.ca.gov/distgen)

<http://www.energy.ca.gov/pier/index.html>





Research Projects by  
Program Area

Program Area Lead  
Contacts



# ***Environmentally-Preferred Advanced Generation***



## **EPAG Mission**

To develop a balanced portfolio and competitive mixture of technologies that will provide value, including efficient utilization of resources, as well as clean, reliable, and high-quality electricity for California.

Team Lead: Mike Batham

(916) 654-4548

[mbatham@energy.state.ca.us](mailto:mbatham@energy.state.ca.us)

*Project descriptions for EPAG are provided on following pages*



## Project Descriptions: *Environmentally-Preferred Advanced Generation*

**EPAG has 31 DER projects: 10 completed, 21 ongoing and 0 planned (1/4).**

Description of DER Projects				
Title	Research Question Addressed	CEC Funding (thousands \$)	Project Completion Date	Timeframe to Answer Research Question
Durability of catalytic combustion systems	Can we improve catalytic combustion technology for on-engine field testing in 1.5 MW Kawasaki gas turbine engine?	\$1,316	3/31/02 Completed	Short <1yr
Low NOx gas turbine combustors for distributed power generation	Can we develop gas turbine semiradiant burner (GTSB) for gas turbine applications?	\$879	3/31/02 Completed	Short <1yr
Xonon ultra-low combustion in small multican turbines	Can we develop component technologies and complete engineering design of a multi-can catalytic combustion system?	\$2,998	12/31/03	Medium 1-3yrs
Development of a partial oxidation gas turbine for combined electricity and hydrogen enriched fuel gas production	Can we develop, test and demonstrate a partial oxidation gas turbine in combination with energy conversion devices?	\$1,618	3/31/04	Medium 1-3yrs
Catalytic combustor - fired gas turbine for distributed power and cogeneration applications	Can we develop a multi-can catalytic combustion system suitable for application in two gas turbines?	\$815	3/31/04	Medium 1-3yrs
Catalytic combustor-fired industrial gas turbine	Can we advance catalytic combustion to the production entry level using Solar's Taurus 60 industrial gas turbine?	\$3,000	9/30/04	Medium 1-3yrs
Microturbine generator operation on alternative fuels	Can we reduce emissions and develop multi-fuel capability for microturbine generator (MTG) technology?	\$2,348	3/30/05	Medium 1-3yrs
Experimental study of jet mixing in rich-burn/quench-mix/lean-burn (RQL) combustors	Can we understand jet mixing as applied to high-temperature, high-pressure combustion typical of gas turbines?	\$269	3/31/05	Long >3yrs
Ultra-Low NOx combustion system for a 13.5 kW gas turbine generator	Can California develop distributed generation capacity without sacrificing environmental quality considerations?	\$2,404	3/31/06	Medium 1-3yrs

A.Environmental Impact; B.Low Cost Power; C.Generation Reliability; D.Grid Effects;  
 E.Interconnection; F.Siting & Permitting; G.Integration; H.Market Structure



## Project Descriptions: *Environmentally-Preferred Advanced Generation*

**EPAG has 31 DER projects: 10 completed, 21 ongoing and 0 planned (2/4).**

Description of DER Projects					
	Title	Research Question Addressed	CEC Funding (thousands \$)	Project Completion Date	Timeframe to Answer Research Question
A	A 500 kW zero-emission gas-fired power plan	How durable and reliable is the fossil-fueled, zero-emission power generation system based on rocket engine designs?	\$2,003	3/31/06	Long >3yrs
A	Catalytic Combustion Retrofit of a Gas Turbine at Sonoma Development Center	Can we advance catalytic combustion to the production entry level using a industrial gas turbine?	\$105	3/31/06	Medium 1-3yrs
A	Low NOx GT Combustor	Can we bring to market gas turbine monolithic injector utilizing surface stabilized combustion technology?	\$1,312	3/31/06	Long >3yrs
A/B	Collaboration with ASERTTI	Can we develop nationally accepted procedures to test and evaluate electricity generation systems that are used as DER?	\$3,739 Match	10/1/05	Medium 1-3yrs
A/B	A n Ultra-Low Emissions System Development Project	Can we develop a natural gas fueled, reciprocating engine system that reduces emissions and installation costs while increasing efficiency?	\$2,995	3/30/06	Long >3yrs
A/B	Low Cost, High Efficiency, Ultra-Low NOx ARICE Solution Using HCCI Combustion	Can we develop a homogenous charge compression ignition based engine/generator that can produce > 200 kW for more than 1,000 hours?	\$1,999	6/30/05	Medium 1-3yrs
A/B	Energy efficient, low emission, cost effective micropilot ignited natural gas engine driven genset for deregulated mtk	Can we develop a the MicroPilot diesel-cycle natural gas engine technology?	\$983	3/31/02 Completed	Short <1yr



## Project Descriptions: *Environmentally-Preferred Advanced Generation*

**EPAG has 31 DER projects: 10 completed, 21 ongoing and 0 planned (3/4).**

	Description of DER Projects				
	Title	Research Question Addressed	CEC Funding (thousands \$)	Project Completion Date	Timeframe to Answer Research Question
B	75-kW molten-carbonate fuel cell (MCFC) stack verification test	Can we demonstrate the energy-producing performance of advanced design MCFC in a 75kW generator?	\$1,000	3/31/02 Completed	Medium 1-3yrs
B	A novel steam reforming reactor for fuel cell distributed power generation	Can we develop a novel steam reforming process to convert natural gas to a H-containing mixture on a small scale?	\$350	3/31/02 Completed	Medium 1-3yrs
B	Emerging distributed resource technologies	Can DER provide a substantial portion of the energy alternatives now demanded by California electricity users?	\$429	12/31/02	Medium 1-3yrs
B	Advanced fuel cells	Can we develop low cost, very efficient, planar solid oxide fuel cells (SOFC's) to operate at 650-800 C?	\$103	12/31/02	Long >3yrs
B	Reduced temperature, electrode-supported planar (RTESP) solid oxide fuel cell (SOFC) submodule	Can we design, fabricate, operate and test a 3 kW sub-scale SOFC stack and balance of plant?	\$3,000	3/31/06	Long >3yrs
B	Testing, optimization and demonstration of an EPAG microturbine	Can we use novel technologies to improve the performance of a 300kW microturbine?	\$2,867	3/31/06	Long >3yrs
B	An integrated distributed power system using a PEM fuel cell and an autothermal cyclic reformer (ACR)	Is the autothermal cyclic reformer-based fuel processor integrateable with a proton exchange membrane (PEM) fuel cell?	\$1,959	3/31/06	Long >3yrs
B	Collaboration with Federal Energy Management Program	Are there federal sites in California with CHP potential worth developing?	\$150 Match	12/31/05	Short <1yr



## Project Descriptions: *Environmentally-Preferred Advanced Generation*

**EPAG has 31 DER projects: 10 completed, 21 ongoing and 0 planned (4/4).**

	Description of DER Projects				
	Title	Research Question Addressed	CEC Funding (thousands \$)	Project Completion Date	Timeframe to Answer Research Question
B/C	Reduced-temperature solid oxide fuel cell (SOFC) operating on the direct oxidation of natural gas	Can we develop a commercially viable planar SOFC with high reliability, reduced operating temperature and high efficiency	\$3,000	3/31/06	Long >3yrs
C	Fuel cell development and demonstration	Can we demonstrate performance and reliability of a molten carbonate fuel cell (MCFC) electric generating tech?	\$300	1/31/00 Completed	Medium 1-3yrs
G	Distributed resources demonstration	How can small DG systems be seamlessly integrated into existing electric distribution systems?	\$450	1/31/00 Completed	Medium 1-3yrs
G	Analysis and technology transfer for fuel cells	How do fuel cell systems and fuel cell/microturbine hybrid systems operate? How can we improve transfer at NFCRC?	\$308	6/30/00 Completed	Medium 1-3yrs
G	Micro turbine generator (Distributed Generation)	How do small gas turbines respond in distributed electrical generation applications?	\$500	6/30/01 Completed	Short <1yr
G	Solid-oxide fuel cell / micro turbine generation hybrid	Can we integrate two dissimilar electricity producing distributed generation technologies as an integrated system?	\$2,000	6/30/01 Completed	Long >3yrs
G	Microturbine generators, fuel cells and hybrid systems development	Can we standardize testing and reporting procedures for microturbine generators? Develop steady-state analytical tools?	\$1,409	7/14/04	Medium 1-3yrs

# Renewable Energy Technologies



## Mission

PIER Renewables research and development activities focus on the development of advanced renewable energy technologies, products and services that will help make California's electricity more diverse, more affordable, more reliable, cleaner, safer and enhances customer choice.

Team Lead: George Simons  
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[gsimons@energy.state.ca.us](mailto:gsimons@energy.state.ca.us)

*Project descriptions for Renewables are provided on following pages*



## Project Descriptions: *Renewable Energy Technologies*



**Renewables has 30 DER projects: 6 completed, 24 ongoing and 0 planned (1/4).**

Description of DER Projects					
	Title	Research Question Addressed	CEC Funding (thousands \$)	Project Completion Date	Timeframe to Answer Research Question
A/B	Powerguard California Manufacturing	How can PV costs be lowered to help increase customer choice and make electricity more affordable?	\$959	3/31/02 Completed	Short <1yr
A/B	The Next Generation Turbine Development Project	Can wind turbine costs be lowered to \$0.025/kwhr at sizes that make wind DG feasible?	\$950	3/31/02 Completed	Short <1yr
A/B	Powertherm Product Development	How can PV provide added energy value to customer choice?	\$542	3/31/02 Completed	Short <1yr
A/B	Residential Electric Power Security	How can PV system prices be lowered while simultaneously increasing reliability and value?	\$426	3/31/02 Completed	Short <1yr
A/B	The Flex-Microturbine Uniquely Adapted to Low Pressure Biomass Gas	Can a small modular biomass system be developed to utilize low Btu gases that reduce costs and lower NOx emissions?	\$984	3/31/04	Medium 1-3yrs
A/B	Utilization of Waste Renewable Fuels in Boiler with Minimization of Pollutant Emissions	How can low quality biomass fuels be utilized to existing biomass boilers and lower NOx emissions?	\$982	3/31/04	Medium 1-3yrs
A/B	Application of Small Modular Biopower System for Power Generation from Forest Residue	How feasible is a small modular gasification system for combined heat and power application?	\$646	3/31/04	Medium 1-3yrs
A/B	Wind Turbine Company EMD Turbines	Can load mitigation techniques produce a wind turbine with an unsubsidized COE <\$0.03/kWh at 15 mph wind sites?	\$1,300	6/30/04	Medium 1-3yrs
A/B	CW - 3.1 Dairy Waste to Energy	How to optimize the energy recovery from dairy waste that can minimize environmental costs?	\$3,275	3/31/05	Long >3yrs

A.Environmental Impact; B.Low Cost Power; C.Generation Reliability; D.Grid Effects;  
 E.Interconnection; F.Siting & Permitting; G.Integration; H.Market Structure





## Project Descriptions: *Renewable Energy Technologies*

**Renewables has 30 DER projects: 6 completed, 24 ongoing and 0 planned (2/4).**

Description of DER Projects					
	Title	Research Question Addressed	CEC Funding (thousands \$)	Project Completion Date	Timeframe to Answer Research Question
A/B	SMUD - 3.1 UNI-SOLAR PV Roofing	How can PV systems be deployed faster, with lower costs for California buildings?	\$1,508	3/31/05	Long >3yrs
A/B	SMUD - 3.3 SunTile: Mainstreaming PV for Residential Rooftops	How can PV modules be aesthetically integrated into California's concrete tile roofs?	\$1,500	3/31/05	Long >3yrs
A/B	SMUD - 3.8 Solar Dish Concentrating with Stirling Engine	Can concentrating solar play a role in large DG energy solutions for California?	\$1,301	3/31/05	Long >3yrs
A/B	SMUD - 4.5 Distributed Generation Geartrain for Megawatt Turbines	Can geartrain torque splitting enhance DG by reducing capital and maintenance costs in megawatt scale wind turbines?	\$1,299	3/31/05	Long >3yrs
A/B	SMUD - 3.5 Optimization of Residential PV Systems	How can insulation be added to residential PV systems to provide dual DG value?	\$1,127	3/31/05	Long >3yrs
A/B	CW - 3.2 Building Integrated PV Evaluation	How can PV systems be evaluated for AC watts increasing consumer confidence and markets?	\$870	3/31/05	Long >3yrs
A/B	CW - 3.3 Building Integrated PV Generation	How can government facilities be used for highest value building integrated PV systems?	\$828	3/31/05	Long >3yrs
A/B	SMUD - 4.2 Maximum Power Point Tracker & Operational Dispatch	How can unused stored energy from PV be deployed to reduce super peaking?	\$709	3/31/05	Long >3yrs
A/B	Hetch Hetchy - Project 4.3 Energy Storage for Renewable Generation	How can energy storage increase the economic effectiveness of wind and PV renewable energy resources?	\$319	3/31/05	Long >3yrs

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Description of DER Projects					
	Title	Research Question Addressed	CEC Funding (thousands \$)	Project Completion Date	Timeframe to Answer Research Question
A/B	SMUD - 1.2 PV Markets and Technologies (SEPA)	How can SMUD PV experiences be replicated at other utilities?	\$316	3/31/05	Long >3yrs
A/B	SMUD - 3.4 Flat Roof Mounting Approaches	How can PV balance of systems costs in be lowered for commercial buildings?	\$100	3/31/05	Long >3yrs
A/B	SMUD - 3.2 BIPV Mounting Approaches for New Construction	How can PV balance of systems costs in be lowered for sloped roof buildings?	\$99	3/31/05	Long >3yrs
A/B	SMUD - 3.7 PV and Evaporative Cooling	How can needle peaks from HVAC loads be reduced with PV systems?	\$50	3/31/05	Long >3yrs
A/B	SMUD - 3.6 Remote Dispatch & PV Irrigation	How can water be pumped with PV providing additional peak utility power?	\$77	3/31/05	Long >3yrs
A/B	Powerwheel Demonstration	Can the very low head (<10') drops common in irrigation canals supply DG hydropower at a competitive COE?	\$200	3/31/07	Long >3yrs
G	Information to Support High-Value Photovoltaic Power Applications	How can resource assessment be used to reduce peaking utilities with solar systems?	\$27	6/30/02 Completed	Short <1yr
G	Renewable Energy Applications in Distributed Generation	How to maximize the value of using renewables for distributed generation?	\$13	6/30/02 Completed	Short <1yr
G	Strategic Value Analysis: Power Flow Simulations and Development of Renewable RD&D Performance Goals	How to reduce costs and improve the value of renewable energy utilization in California?	\$730	6/30/04	Medium 1-3yrs

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## Project Descriptions: *Renewable Energy Technologies*



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	Description of DER Projects				
	Title	Research Question Addressed	CEC Funding (thousands \$)	Project Completion Date	Timeframe to Answer Research Question
	<div>G</div> Strategic Value Analysis: GIS Development	How can GIS tools improve the utilization value of renewables for electricity generation?	\$280	6/30/04	Medium 1-3yrs
	<div>G</div> Hetch Hetchy - Project 3.2 Biomass Project Distributed Generation Value Analysis	How can small modular biomass generators provide high strategic value to the electricity system?	\$730	3/31/05	Long >3yrs
	<div>G</div> Hetch Hetchy - Project 3.1 Distributed Generation Assessment	What are the best locations for renewables DG with improved reliability impacts?	\$591	3/31/05	Long >3yrs

## **Mission**

The ESI DER Integration program funds system-level research and enabling RD&D in the areas of interconnection, grid effects, and market integration.

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*Project descriptions for ESI are provided on following pages*



## Project Descriptions: *Energy Systems Integration*

**ESI has 15 DER projects: 3 completed, 12 ongoing and 0 planned (1/2).**

Description of DER Projects					
	Title	Research Question Addressed	CEC Funding (thousands \$)	Project Completion Date	Timeframe to Answer Research Question
<b>B</b>	Emerging distributed resource technologies	Can distributed resources provide a substantial portion of the energy alternatives now demanded by users?	\$461	12/31/02	Short <1yr
<b>B</b>	2 kWh Flywheel energy storage system	Can we use a flywheel energy storage system as a load shifting technology to be used during peak load periods?	\$1,057	3/31/04	Medium 1-3yrs
<b>D</b>	Development /demonstration of methodology to assess value of DER	How can we measure and quantify the grid benefits or impacts that DER generates for the distribution and transmission system?	\$617	6/30/04	Medium 1-3yrs
<b>D</b>	Distributed utility integration test -DUIT	What are the grid effects of integrating large numbers of DER into the distribution system?	\$2,000	12/31/03	Medium 1-3yrs
<b>D/E</b>	Interconnection rules and processes - Focus II	How should rule 21 be modified to level cost and insure safety? What are the impacts of DER on distribution system?	\$546	12/31/04	Medium 1-3yrs
<b>E</b>	Interconnection guidebook	How can interconnection processes be standardize? What are the best practices for interconnection?	\$65	12/31/02	Short <1yr
<b>E</b>	Support for the IEEE 1547 interconnection	Can we develop a nationwide standard for interconnection?	\$72	12/31/04	Medium 1-3yrs
<b>E/F</b>	Interconnection requirements for distributed energy resources - Focus I	What are the intercon reqs for DER? Land use issues for CA? Permitting issues for local permitting authorities?	\$395	12/31/01 Completed	Short <1yr



## Projects Descriptions: *Energy Systems Integration*

**ESI has 15 DER projects: 3 completed, 12 ongoing and 0 planned (2/2).**

	Description of DER Projects				
	Title	Research Question Addressed	CEC Funding (thousands \$)	Project Completion Date	Timeframe to Answer Research Question
G	Distributed resources demonstration - SDG&E	Can we effectively implement DER?	\$450	1/31/00 Completed	Short <1yr
G	Demonstration of intelligent software agents for control and scheduling of distributed generation - Phase I	Can we effectively schedule distributed generation and/or other energy resources in the marketplace?	\$500	3/31/02 Completed	Medium 1-3yrs
G	Distributed energy resources public website	How can we use the CEC's website to promote and coordinate DER activities in the state?	\$160	12/31/02 Completed	Short <1yr
G	Intelligent software agents for control and scheduling of distributed generation - Phase II	Can we effectively schedule distributed generation and/or other energy resources in the marketplace?	\$554	3/31/04	Medium 1-3yrs
G	CERTS microgrid laboratory test planning	What are the interconnection impacts of a rogrid?	\$450	12/31/04	Medium 1-3yrs
H	Distributed resources information and tools for business strategy development	What is the size of the opportunity for DER and what are the most attractive applications?	\$596	12/31/02	Long >3yrs
H	Identifying opportunities in distributed generation - 2001	What are the application characteristics and technical requirements for the strategic utilization of gas-fired DG?	\$179	12/31/02	Short <1yr

# ***Energy-Related Environmental Research***



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*Project descriptions for Energy-Related Environmental Research are  
provided on following page*



## Project Descriptions: *Energy-Related Environmental Research*

**Environmental has 4 DER projects: two completed, two ongoing and 0 planned.**

Description of DER Projects				
Title	Research Question Addressed	CEC Funding (thousands \$)	Project Completion Date	Timeframe to Answer Research Question
Emissions testing and certification guidelines for distributed generators	What would be an acceptable testing protocol and criteria for any DG devices applying for “fleet” certification in CA?	\$90	11/30/00 Completed	Short <1yr
Distributed generation in natural environment	Environmental rank of DG? What is the appropriate level of governance and policy for DG to improve air quality?	\$46	9/30/02 Completed	Short <1yr
Improvement of short range dispersion models (planned)	How to improve short models that would reflect localized impact of DG and central power plants?	\$437	7/1/02 - 6/30/04	Medium 1-3yrs
Regional and overall air quality impact: widespread distributed generation application in Southern California	What is the air quality impact of widespread use of DG in Southern California?	\$699	3/31/05	Long >3yrs



# ***Industrial Agricultural Water End-Use Energy Efficiency***



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*Project descriptions for IAW are provided on following page*



## Project Descriptions: *Industrial Agricultural Water End-Use Energy Efficiency*

### IAW has three ongoing DER projects

Description of DER Projects				
Title	Research Question Addressed	CEC Funding (thousands \$)	Project Completion Date	Timeframe to Answer Research Question
Combustion of pullulating “off-gases” for DG (planned)	Can we economically modify turbines to effectively combust off-gases and reduce flaring and/or emissions from them?	\$1,000	9/31/02 - 9/31/04	Medium 1-3yrs
Storage technology to meet industry customer needs (planned)	Does the basic technology work? Can it respond to needs in a customer setting?	\$1,000	9/31/02 - 9/31/04	Medium 1-3yrs
Methodology to Optimize Compressed Air Energy Storage for Industry		\$178	3/01/02 - 5/15/03	Short <1yr

# ***Buildings End-Use Energy Efficiency***



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*Project descriptions for Building Efficiency are provided on following page*



## Project Descriptions: *Buildings End-Use Energy Efficiency*

**Buildings has only one ongoing project directly related to DER.**

Description of DER Projects				
Title	Research Question Addressed	CEC Funding (thousands \$)	Project Completion Date	Timeframe to Answer Research Question
Impact assessment of building integrated PV for California	What is the performance of the building integrated PV?	\$377	3/31/04	Medium 1-3yrs

A/B